

E-Emergency Management: the Operational State of the Art

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Abstract:

In a world of e-commerce and "dotcom," with a full range of governmental services increasingly being offered on the Internet, what is the state of electronic emergency management? Increasingly, the term Virtual Emergency Operations Center (EOC) is used to describe everything from an EOC in relation to computers, through facilities that offer public information to Internet users, to truly virtual facilities that apply incident command system management principles to supply services electronically. E-emergency management is being deployed component by component, with components being chosen to meet single needs--how to communicate, how to get public information disseminated, how to look at a variety of weather sources. Such growth is demonstrating impressive capabilities that have the potential to make the emergency manager's job easier and to increase the services offered to citizens. However, the significant issue remains to identify what functions emergency management performs, and how to perform those same functions in a distributed manner. The critical questions become what this potential capability can do, how it should be organized and managed, and how it makes emergency management more flexible, more survivable, and more effective.

Introduction

The last decade saw the explosion of the Internet as a tool for communications and commerce. The use of the term "e-" or "dotcom" now identifies an activity or organization as a uniquely progressive part of modern business, government, and daily life. So where does emergency management stand; is it realistic to start referring to "e-emergency management," and begin defining the use of the electronic environment as a new way to perform professional disaster-related work at the local level?

This paper focuses on the state (or provincial) and local level. Well-funded initiatives using high technology exist in some jurisdictions. These push the state of the art; however, it is questionable whether these cases accurately reflect practice in the majority of sub-national emergency management organizations.

The State of the Art Anecdotally

There are undoubtedly differences in the degree of electronic integration existent depending on the function. Today, it is rare to find government offices in the United States, even in small and relatively poor jurisdictions, where every desk does not have a desktop computer. The ability to word process, manage budgets by spreadsheet, and communicate with both colleagues and the public by e-mail is too important to ignore in the normal day-to-day business of government.

However, this level of automation does not extend universally to emergency operations centers. In 1997 and 1998, the author visited three county and city emergency operations centers in jurisdictions that had invited evaluation by the Virginia Department of Emergency Services in a Local Emergency Management Operations Exercise. In two cases, the single computer in the operations room was a terminal used to review dispatches made by the public safety dispatch centers. In the third case, a computer was added for a Geographic Information Systems display. The level of automation in jurisdictions that depend on converting a conference room in a crisis or with no designated emergency operations center is probably even lower.

At the state level, the integration of computers into emergency operations centers is more complete. For example, in Virginia, the State Emergency Operations Center, the Transportation Emergency Operations Center, and the Health and Medical Emergency Support Center, are fully computerized with multi-function emergency management software. However, in one state emergency operations center visited in 1999, the single monitor in the operations room was a status display of a nuclear power station's Local Emergency Operations Facility.

Software products provide a full range of emergency management decision support, resource management, and incident documentation functions. The Emergency Information System (EIS), SoftRisk, and EM 2000 are all powerful tools allowing most emergency management functions to be performed on a high-end desktop or laptop computer. ExlErate is at the simple end, providing a macro-based system that allows maintenance of a set of status boards in Excel.

The State of the Art in the Literature

The 1984 edition¹ of the *Emergency Operating Centers Handbook* recommended that "preference should be given to nonelectric machines, such as manual

¹ To the best of the author's knowledge, this is the last edition published. There is no current Federal Emergency Management Agency document that provides consolidated guidance for management of emergency operations centers.

typewriters or hand-operated mimeograph machines, and battery-operated equipment such as calculators and recorders" (F-2). In the context of nuclear war survival, this advice makes sense. However, the failure to include computers as a critical component of emergency operations centers continued to as late as 1995. In that year, the new Federal Emergency Management Agency field delivery training course, EOC's Management and Operations, included computers on a supply list (3-13) and referenced the need for a system administrator for disaster computer operations (2-24). However, it did not address the actual role of computers and made no mention of the potential of the Internet as a communications tool.

However, emergency management agencies did not ignore the computer in the 1980s and early 1990s. For example, the Wyoming Emergency Management Agency was recognized in 1988 for its exemplary office computerization program. In addition to such functions as word processing, the Agency was starting to use computer-based databases for resources tracking, was participating in the State and Local Emergency Management data Users Group for professional exchanges, and was starting to explore the use of computers for communications with Wyoming counties (Federal Emergency Management Agency 1988).

By 1986, some visionaries were beginning to project and develop computer systems to perform essential emergency management functions. Morentz suggested that incorporation of computers into emergency management was critical to the effective use of information to protect communities in disasters. In 1988, a series of papers at the Symposium on Information Technology and Emergency Management held in Gatlinburg, Tennessee, addressed a wide variety of potential applications, including discussions of information resource definition, optimum use of information, networking systems, and decision support (Chartrand and Chartrand 1989). By 1996, emergency managers were discussing specific applications of existing technology. For example, Robert McDaniel suggested that computers could be used to simulate many of the information sources in an emergency operations center to facilitate free-play exercises. And in 1998, Grunfest and Weber asserted that "the Internet has been beneficial in emergency management by providing comprehensive data resources and increasing professionalism because of a sharing of expertise" (67).

Today, the criticality of computers to emergency management programs may be inferred by reviewing annual recognition of Exemplary Practices in emergency management. In three volumes published by the Federal Emergency Management Agency, a total of 152 projects were profiled ranging from Fire Explorer Posts² to nuclear disaster preparedness. Of the 152, 2.6% (n=4) used computers and the Internet in ways that increased public access to emergency information or the efficiency of emergency management disaster operations (see table 1).

² Exploring is a career-oriented, young adult program of the Boy Scouts of America.

Table 1. Computer Based Exemplary Emergency Management Programs 1995-1998

Year:	Total Programs:	Computer Based:
1995	64	none
1997	38	meteorological consultation services
1998	50	agricultural database tied to geographic information Internet based severe storm public information site professional interchange Internet site

Note: This compilation does not include programs that used computers for word processing to prepare documents (one cited in 1995) or for research studies that did not appear to have direct operational use (three in 1995 and one in 1997).

Sources: Federal Emergency Management Agency, Partnerships in Preparedness: A Compendium of Exemplary Practices in Emergency Management, Washington, DC, U. S. Government Printing Office, 1995. Federal Emergency Management Agency, Partnerships in Preparedness: A Compendium of Exemplary Practices in Emergency Management, Volume II, Washington, DC, U. S. Government Printing Office, 1997. Federal Emergency Management Agency, Partnerships in Preparedness: A Compendium of Exemplary Practices in Emergency Management, Volume III, Washington, DC, U. S. Government Printing Office, 1998.

What Is Happening on the Web?

Internet Presence by Emergency Management Agencies

Today, an Internet presence is almost a universal practice by North American state emergency management agencies. All 50 United States state that emergency management agencies have Internet sites, as do 10 of 13 Canadian Provinces. Likewise, eight state emergency management associations have established a Web presence. The content of such sites varies greatly, but includes such categories as contact information, agency missions, newsletters and annual reports, links to emergency information relevant to the jurisdiction, public education materials, and even complete texts of plans (Integrated Emergency Management Benchmark 2000).

The Internet as Professional Information Exchange

One of the more interesting developments in the use of the Internet for information exchange has been the emergence of the Emergency Infrastructure Information Program (EIIP), which hosts a weekly formal presentation on some aspect of emergency management through chat. Although there are listservs and discussion groups for emergency management, the moderated character of the EIIP and its archives of presentations makes it more trustworthy and a "dynamic exchange of emergency management information" (Moore 1997, 57).

Exercises on the Web

The first relevant electronic mail-based exercise may have been a March 1996 tabletop exercise conducted by members of the Local Emergency Planning Committee Mailing List. This exercise included a scenario and exercise messages, to which participants reacted by providing their suggested actions (Pasquarelli 1996).

In November 1998, as part of the Virtual Fire and Rescue Exposition, the Emergency Information Infrastructure Partnership conducted WEBEX, an Internet exercise using chat as the medium for information exchange in a simulated emergency operations center, incident command post, and other work areas (Sebring 1999). A second WEBEX was conducted in December 1999 ("WEBEX ii: Featuring the City of Pittsburgh, Pennsylvania" 1999). Not only were the participants in these two exercises a disparate group drawn from across the country, but the medium of play also allowed participation by a large number of people--77 in WEBEX 98.

The Emergence of the Meta-Site as Truth

With the aid of modern page building software, one can rapidly create a complete Internet site to provide a wide variety of helpful, even vital, information. However, none of this information resides on the new site; it is presented through links to other sites. By pasting together dozens of sources, the meta-site emerges as a view of reality that may or may not be true. The user of the site depends on the emergency management knowledge of the site owner and his or her ability to select information sources for their operational value. Interestingly enough, one never sees these links assigned a measure of confidence³ as a guideline for their use for decision making—it is as though all links are created equal. Perhaps even more limiting is the reality that the meta-site can only present links to information electronically available; if information is not on the Web, it disappears from the reality of the meta-site, but not from that of the disaster.

³ The author is familiar with only one site that provides assessments of emergency management sites, in the context of their value for academic research and instructional purposes (Integrated Emergency Management Benchmark 2000).

Moving Toward the Virtual Emergency Operations Center

Some emergency management agencies are placing real-time hazard information and decision-making tools on their Internet sites, as are large meta-sites, including Emergency Management Gold and the Disaster Center. The Disaster Center now produces a daily situation report summarizing the site owner's assessment of the national disaster situation. The National Voluntary Organizations Active in Disaster maintains a listserv⁴ to rapidly disseminate situation reports of disaster participation by its member agencies. And an initiative at Simon Fraser University seeks to "establish an experimental virtual emergency operations center, where wireless information networks, interconnected to other fixed and mobile networks, allow managers to remain in the information loop, either until they can reach their EOC destinations, or as a substitute for physical presence at the EOC" (Anderson n.d.). All of these functions begin to duplicate activities and products of a traditional bricks-and-mortar emergency operations center.

In Virginia, one volunteer organization, the Virtual Emergency Operations Center, has gone a step beyond experiment to actually run an emergency operations center supporting other agencies with a completely Internet architecture. There are two significant differences between this and operations such as those of the meta-sites and experimental sites. First, the Virtual EOC is performing specific information dissemination work for served organizations without any attempt to serve the general public. Second, this process is managed using an incident command system, emergency operations plans, and emergency operations center procedures by individuals who are widely geographically separated. This provides both a measure of survivability and wide access to information.

Dangers for Managers

The explosion of information creates the potential for significant problems for emergency managers. Most basic is the question "What do you trust?" This has for some time been an issue in academia; for example, one commentator in *The Chronicle of Higher Education* characterized the dilemma as "the inability to extract the useful scholarly nuggets from the mountains of digital gravel and slurry can be frustrating" (Gants 1999). Others say frankly that "although the Internet offers a wealth of information, much of it is of questionable value" (McGuire, Stillborne, McAdams, Hyatt 1997, 10), or they offer specific suggestions for validating sources (Rodrigues 1997). If scholars, with time to review information, find this frustrating, the decision-maker forced to make decisions in minutes rather than hours or days can certainly be excused for wondering who or what to trust.

⁴ A listserv is an automated electronic mail management and distribution system.

The information explosion creates a need for education to understand what is being presented. Ten years ago, there was little competition for which forecast emergency managers would use. Experience suggests that this is no longer a given. Prior to a hurricane conference call today, this author reviews the National Weather Service advisories (available as the Weather Wire on DTN⁵), looks at the official storm data on HURREVAC,⁶ reviews the picture presented by HURRTRAK,⁷ checks the Weather Channel's ten-minutes-before-the-hour severe storm coverage, and checks several selected Internet sites. When listening to the National Weather Service forecasters, after having access to this tremendous amount of data, it is tempting to view their discussion with a certain air of superior knowledge.

It is interesting that this is happening during a backlash against higher education in emergency management. One candidate for president of the International Association of Emergency Managers based his 1997 campaign in some measure on public pronouncements that requiring a college degree as a measure of professionalism was an insult to hard-working emergency managers who were busy protecting their communities and not in the classroom (Appleby 1997). In 1998, as a result of pressure from the Association's Region IV and the Texas Emergency Management Association (National Coordinating Council on Emergency Management 1997), the International Association of Emergency Managers deleted the requirement for a Bachelor's degree as a component of certification as a Certified Emergency Manager.

Not to be overlooked is the potential for public second-guessing, before or after an event. As a working emergency manager, this author routinely has colleagues ask about the potential for severe weather, the course of a particular tropical storm, or other events. These questions are always preceded by reference to an Internet site they have accessed. It intuitively appears to be a small step to the general public using Internet information as the basis for personal decision-making. On the one hand, if the information is good and it leads to early self-evacuations in a high-hazard situation, then emergency management will profit from easy Internet access. If, however, the information is bad, the potential for more people being at risk is probably increased.

⁵ DTN is a commercial weather service that offers satellite delivery of a variety of weather products with continuous updates.

⁶ HURREVAC is a standard hurricane tracking, inundation, and evacuation decision software distributed to emergency management agencies.

⁷ HURRTRAK is a commercial hurricane weather service that provides a superior graphic presentation of current and forecast hurricane data.

Defining E-Emergency Management

At the start of this paper, the question was posed whether it was time to begin to define e-emergency management as a new form of professional work. This author asserts that the answer must be yes. In a recent short note in the newsletter of the State and Local Emergency Management Data Users Group, the national emergency management technology association, this author suggested that some of the components of a virtual emergency operations center might include:

- use of emergency management software to communicate internally and externally and to manage data.
- remote access to emergency operations center databases and communications.
- access to Internet sites to gather information.
- dissemination of information on the Internet both to official response organizations and for public access.
- linking dispersed individuals to perform emergency operations center functions remotely (Green 2000).

If we think beyond the emergency operations center, other potentials emerge for e-emergency management. Some agencies have placed significant amounts of public education information on line, and the University of Richmond is now teaching Federal Emergency Management Agency professional technical courses using Internet delivery. Is there room for a variety of public education and technical training, delivered just in time, ranging from mitigation to recovery?

Information sites are already disseminating warning information and instructions of value to the general public during disaster onset. The development of systems linking governmental agencies to allow rapid data interchange to complement each others' operations increases the reach and capability of emergency management—the Virginia Operational Information System is an example (Thomas 2000). Specific tasks supporting an emergency operations center or emergency management agency are already being performed off-site in one case, and the potential exists for this to be a reasonably routine mutual aid procedure.

The challenge of any of these approaches lies in the commitment of resources. The technological solutions to problems that could be addressed by e-emergency management are not overwhelmingly difficult. However, they require money and staff to carry out. More importantly, they do not reduce the need for highly trained and educated emergency managers to evaluate and apply their products as part of an overall governmental response to disasters. Therefore, a definition of e-emergency management is suggested as:

a system of computer-based tools and communications architectures, managed by trained personnel using standard plans and procedures to communicate and manipulate data for public information, program

management, decision-making, and policy establishment to protect communities from the effects of disasters.

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